

**819.04 MEASUREMENT AND PAYMENT.** Steel Span Wire of the size specified in the Contract Documents will be measured and paid for at the Contract unit price per linear foot for the wire installed. The payment will be full compensation for all hardware, material, labor, equipment, tools, and incidentals necessary to complete the work.

## **SECTION 820 — GENERAL ELECTRICAL WORK AND TESTING**

**820.01 DESCRIPTION.** This work shall consist of furnishing, installing, and testing of all applicable electrical items referred to in Category 800.

**820.02 MATERIALS.** All materials and equipment installed as part of the permanent installation shall be new, UL listed, or labeled, and shall conform to NEC, NESC, NEMA, IES, and local codes applicable to the area of installation.

### **820.03 CONSTRUCTION.**

**820.03.01 General.** All installations shall conform to NEC, NESC, local utility company requirements, and State and local laws and ordinances governing the work. All electrical work shall be accomplished under the direct supervision of a master electrician licensed in the State of Maryland, or in the county where the work is being performed. All work performed under Sections 804, 805, 806, 807, 810 (except loop wire), 811, 814, 816, 817, and 820 shall be performed by a journeyman electrician. The Contractor shall obtain and pay for all permits, licenses and inspection fees.

**820.03.02 Testing.** The Contractor shall supply all personnel and equipment required to successfully perform the following tests and shall furnish four certified copies of the complete test reports to the Engineer.

Not less than 30 days prior to the commencement of each required test, the Contractor shall submit to the Engineer the types, styles or catalog numbers of all testing equipment to be used for the tests. A written certification shall be included stating when the testing equipment was last calibrated by an Administration approved testing agency. The calibration date shall be within 180 days of the date when the tests are to be performed. All tests shall be performed in the presence of the Engineer.

Any defects found in the completed installation shall be repaired or replaced immediately to the satisfaction of the Engineer at no additional cost to the Administration.

- (a) **Ground Resistance Testing.** Ground resistance testing shall be conducted using a megger ground tester, using the null balance fall of potential method. Corrected readings greater than 25 ohms will not be accepted.
- (b) **Circuit Testing.** A circuit test to determine insulation resistance shall be performed on all cables of every circuit except those installed in lighting structures. Cable insulation resistance shall be a minimum of 10 megohms at 500 volts D.C. except loop detector wire and loop detector lead in shall have a minimum of 100 megohms at 500 volts D.C.

The Contractor shall demonstrate in a manner acceptable to the Engineer that all conductors are continuous, free from short circuits and unspecified grounds, and that all circuits are properly connected as specified in the Contract Documents.

- (c) **Performance Testing.** A performance test using the design power source shall be conducted by the Contractor prior to acceptance. The electrical system, including automatic control equipment, shall be operated for 30 consecutive days without failure. If any component fails, it shall be immediately replaced and the test shall be continued. The Contractor shall record each fault, the method and date of correction of each, and the beginning and end of the 30 day test period. If more than 5 percent of any component fails during the test, the component shall be replaced and the 30 day test cycle for the entire system shall be restarted.
- (d) **Illumination Testing.** An illumination test shall be conducted by the Contractor to determine the illumination characteristics of the roadway lighting installation. The test shall conform to procedures approved by the Administration.

**820.03.03 Traffic Signal Testing.** Testing shall be accomplished without hazard to the traveling public.

The Contractor shall maintain all new materials until satisfactorily tested and their operation accepted by the Engineer.

All signal heads and signs in place but not in use shall be entirely covered with opaque burlap.

After completion, testing, and acceptance, any new traffic signal shall be placed on flashing operation for a 72 hour period prior to placing the signal on full color operation. Existing full color and flashing signals shall not flash, but shall be kept in operation until the new signal is completed, satisfactorily tested, and approved by the Engineer.

The Contractor shall remove any STOP signs at new full color signals at the end of the 72 hour flashing period. The date and time of removal shall be logged and provided to the Engineer.

All signal heads, signs, spans and mast arms, that are not to be put in use, shall be removed upon acceptance by the Engineer and placement of the new traffic control device into operation.

New traffic signals, exclusive of signal system interconnect installation, may be placed into operation upon completion of the new traffic signal being satisfactorily tested and accepted by the Engineer. Upon the signal system interconnect installation completion, the signal system interconnect shall also be satisfactorily tested and approved by the Engineer.

**820.04 MEASUREMENT AND PAYMENT.** General electrical work and testing and the as-built drawings will not be measured but the cost will be incidental to the other pertinent items specified in the Contract Documents.

## **SECTION 821 — BREAKAWAY BASE SUPPORT SYSTEMS**

**821.01 DESCRIPTION.** This work shall consist of furnishing and installing breakaway base support systems or installing Administration furnished breakaway base support systems as specified in the Contract Documents.

**821.02 MATERIALS.** Breakaway base support systems shall conform to the breakaway requirements specified in AASHTO Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals as approved by the Office of Traffic & Safety.

**821.03 CONSTRUCTION.** The Contractor shall furnish and install breakaway base support systems for signals, lighting and signing, including post hinge assembly units for sign structures, as specified in the Contract Documents and in conformance with the manufacturer's